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GIFFORD PINCHOT, Forester.

SILVICAL LEAFLET 43.

RED OR NORWAY PINE.

Pinus resinosa Ait.

Red or Norway pine is one of the most useful trees of the northeastern United States, not only because of its large size and the high quality of its wood, but also because of its rapid growth and its ability to thrive on light sandy soils. These characteristics promise to make it one of the best trees for reforesting waste lands within its range.

RANGE.

Although it is called Norway pine, the tree is not a native of Norway, but, in its natural range, is confined to the northeastern United States and southern Canada. It grows from near the mouth of the St. Lawrence River, through northern Ontario to Lake Winnipeg in Manitoba, and as far south as northeastern Minnesota, northern Wisconsin, central Michigan, northeastern Ohio, Pennsylvania, and Massachusetts. It reaches its best development and is most abundant and important in Ontario, Minnesota, Wisconsin, and Michigan. In the two latter States lumbering and fire have greatly decreased its former abundance. Throughout its range it is for the most part confined to the poorer situations, chiefly sandy areas.

CLIMATE.

The average annual precipitation within the range of red pine is from 25 to 45 inches. Snow is deep in the winter, while rain is rather evenly distributed during the rest of the year. Red pine seems best adapted to the drier western portion of its range.

The annual range of temperature is especially wide in Minnesota, where extremes of 110° and -59° F. have been recorded. The mean annual temperature varies from about 40° F. in the West to 48° F. in the East. The average winter minimum is above 3° F., and the average maximum in summer below 78° F. During spring the average extremes are about 30° and 50° F. In many portions of the range of red pine frosts occur in every month of the year. Weather Bureau

records collected for a number of years within its range in the United States show that the interval between killing frosts is about four months, on an average, from May 15 to September 15.

ASSOCIATED SPECIES.

In the western part of its range red pine sometimes forms pure stands of considerable extent, but it is most commonly associated with other species, the most important of which are white pine on good sites and jack pine on poorer, sandy soils. In the eastern United States it usually grows in small groups in stands of white pine, and is also found associated with pitch pine. Less frequently it associates with hardwoods, such as aspen, white, red, and scarlet oaks, red maple, and paper birch.

HABIT.

In the forest, red pine is normally a tall, slender tree, with a smooth, straight, clear bole, and little taper. The tree does not ordinarily exceed 2 or 3 feet in diameter and 80 or 100 feet in height, but sometimes attains a height of 120 feet and a diameter of $3\frac{1}{8}$ feet. Young trees have long, pyramidal crowns of stout, horizontal branches in regular whorls. The needles, which are 5 or 6 inches long and in clusters of two, form conspicuous, dense tufts at the end of the branches, and give the crown an open and loose appearance, in strong contrast with the finer foliage and denser crown of white pine. Old trees have short, broad, flattened crowns, quite distinct in form from either white or jack pine. The bark is rather thin, reddish-brown, and on old trees divided into roughly diamond-shaped plates.

The root system consists of a number of stout lateral roots, which, descending at acute angles, give the tree a strong support and make it very wind-firm.

Red pine lumber is harder and stronger than white pine, and its grain resembles that of short-leaf pine. The wood is largely sapwood, and hence is not very durable. It is chiefly useful for general construction, bridge timbers, ship-building, car construction, and flooring. With the decrease in the supply of red pine, its place is being taken by Douglas fir and southern yellow pine.

SOIL AND MOISTURE.

Red pine is usually found on deep, loose, loamy sands or gravels, which retain only a small amount of moisture. It requires better soil than jack pine, but thrives on soil too loose and dry for white pine. In mixture with white pine on sandy soils, red pine predominates on the drier ridges and plains, while the white pine is more abundant on moist lower slopes and depressions. Red pine does not make heavy demands either on soil quality or soil moisture, but it can not endure poor drainage, and is never found in swamps.

TOLERANCE.

Throughout its life red pine is intolerant. It can endure more shade than jack pine, but is decidedly less tolerant than white pine or any other of its common associates except jack pine. Red pine clears itself of branches earlier and more perfectly than any other northern conifer, a habit which adds much to its value as a timber producer.

GROWTH AND LONGEVITY.

In its rate of growth, red pine is intermediate between white pine and jack pine. In youth it grows a little more rapidly both in height and diameter than white pine, especially in the western part of its range, but not so rapidly as jack pine. Though its growth is much more perfect than that of jack pine, it is much less so than that of white pine. Unlike the latter, which often continues to make good diameter growth for 300 years, red pine grows very slowly after about the hundredth year. For this reason red pine remains a more slender tree than white pine.

In moderately dense stands red pine will reach an average diameter of 23 inches and a height of 80 or 90 feet in one hundred and twenty-five years. Stands about 200 years old commonly show clear lengths of from 40 to 60 feet and average diameters of from 20 to 30 inches, depending upon the soil and situation. The maximum age of red pine is about 300 years. Mature stands of red pine are often dense and yield as high as 30,000 or 40,000 feet B. M. per acre.

SUSCEPTIBILITY TO INJURY.

After the pole stage, red pine is somewhat more resistant to light surface fires than either white or jack pine. Because of its deep root system it is seldom wind-thrown. Slender trees are often broken off in severe storms.

No serious insect pests or fungous diseases attack red pine and it is remarkably free from rot, more so than either jack or white pine.

REPRODUCTION.

Red pine is a rather poor seeder. It begins to bear at about 25 years, but the seed years are three or four years apart, and the crops are seldom heavy. This poor seed production leaves it at a disadvantage in competition with jack pine, which is a heavy seeder and often crowds it out, particularly after fires.

The fertility of red pine seed is high, however, and it germinates readily on mineral soil even in moderately dry situations. Red pine will not germinate and grow beneath dense underbrush or in heavy litter or sod, so that on rich moist soils it can not hold its own against hardwoods or white pine. Germination takes place on any kind of

mineral soil which contains a slight amount of moisture, but supports little grass or underbrush, so that the seedlings receive plenty of light. Shading is apparently little needed, as seedlings occur freely in the open. Sod is a serious obstacle to reproduction.

MANAGEMENT.

The silvical characteristics of red pine make it suitable for management by the shelterwood system rather than by the leaving of scattered seed trees. It is only by cutting so as to admit sufficient light for the young red pine without exposing the soil to the drying effect of the sun and wind that dense natural reproduction can be assured. This silvicultural system involves cutting only the mature, overmature, and unhealthy trees, and leaving all thrifty immature trees to form a basis for the second crop and to furnish seed to restock the area.

Red pine should be managed on a rotation of from sixty to one hundred and fifty years, according to the product desired. On account of its rapid early growth it will produce cross-ties and small material in sixty years on a fair quality of soil, but a rotation of about one hundred and fifty years is necessary to obtain saw-timber.

Red pine is one of the few trees which will thrive and attain merchantable size on the sand plains of the Lake States and Canada, and along with white, jack, and Scotch pines it will probably play an important part in the future management of such lands.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., May 27, 1909.

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